

**WHAT IS CLAIMED IS:**

1. An apparatus for transmitting an information signal, comprising:  
2 first interleaver for interleaving a first portion of said information signal in  
accordance with a first interleaving format to provide a first interleaved signal;  
4 second interleaver for interleaving a second portion of said information  
signal in accordance with a second interleaving format to provide a second  
6 interleaved signal;  
shuffler for shuffling said second interleaved signal to produce a shuffled  
8 signal;  
first transmission subsystem for transmitting said first interleaved signal  
10 on a first transmission channel; and  
second transmission subsystem for transmitting said shuffled signal on a  
12 second transmission channel.
2. The apparatus of claim 1 further comprising a demultiplexer for  
2 receiving said information signal and dividing said information signal into said  
first portion and said second portion.
3. The apparatus of claim 2 wherein said demultiplexer divides up  
2 said information signal by placing each odd symbol into said first portion and  
placing each even symbol into said second portion.
4. The apparatus of claim 2 wherein said demultiplexer divides up  
2 said information signal by placing each even symbol into said first portion and  
placing each odd symbol into said second portion.
5. The apparatus of claim 1 further comprising a forward error  
2 correction module for receiving a set of bits and for encoding the sets of bits in  
accordance with a predetermined forward error correction format to provide  
4 said information signal.

6. The apparatus of claim 4 wherein said forward error correction  
2 format is a convolutional encoding format.

7. The apparatus of claim 4 wherein said forward error correction  
2 format is a turbo coding format.

8. The apparatus of claim 1 wherein said first interleaving format and  
2 said second interleaving format are block interleaving formats.

9. The apparatus of claim 1 wherein said first interleaving format and  
2 said second interleaving format are bit reversal interleaving.

10. The apparatus of claim 1 wherein said first interleaving format and  
2 said second interleaving format are different from each other.

11. The apparatus of claim 10 wherein said first interleaving format is  
2 a block interleaving format and said second interleaving format is a bit reversal  
interleaving format.

12. The apparatus of claim 1 wherein said first interleaving format and  
2 said second interleaving format are the same.

13. An apparatus for transmitting an information signal, comprising:  
2 first interleaver for interleaving a first portion of said information signal in  
accordance with a first interleaving format to provide a first interleaved signal;  
4 second interleaver for interleaving a second portion of said information  
signal in accordance with a second interleaving format to provide a second  
6 interleaved signal, wherein said second interleaver comprises means for  
reordering symbols in accordance with a predetermined interleaver format to  
8 provide a shuffled and interleaved signal;

first transmission subsystem for transmitting said first interleaved signal  
10 on a first transmission channel; and

second transmission subsystem for transmitting said shuffled and  
12 interleaved signal on a second transmission channel.

14. The apparatus of claim 13 wherein said shuffler performs  
2 shuffling by cyclically rotating sets of a predetermined number of symbols.

15. The apparatus of claim 14 wherein said predetermined number is  
2 four.

16. The apparatus of claim 15 wherein said shuffler rotates said sets  
2 of four symbols by two symbols.

17. The apparatus of claim 11 wherein said shuffler performs  
2 shuffling by flipping sets of a predetermined number of symbols.

18. The apparatus of claim 17 wherein said predetermined number is  
2 four.

19. The apparatus of claim 13 wherein said first transmission  
2 subsystem transmits said first interleaved signal on a first transmission channel  
by spreading said first interleaved signal in accordance with a first Walsh  
4 function to produce a first Walsh coded signal; and  
wherein said second transmission subsystem transmits said second  
6 interleaved signal on a second transmission channel by spreading said second  
interleaved signal in accordance with a second Walsh function to produce a  
8 second Walsh coded signal.

20. The apparatus of claim 19 wherein said first Walsh function is the  
2 same as said second Walsh function.

21. The apparatus of claim 19 wherein said first Walsh function is  
2 orthogonal to said second Walsh function.

22. The apparatus of claim 19 wherein said first transmission  
2 subsystem and said second transmission subsystem are synchronized in time  
and phase.

23. The apparatus of claim 19 wherein said first transmission  
2 subsystem further comprises a first PN spreader for receiving said first Walsh  
4 coded signal and spreading said first Walsh coded signal in accordance with a  
6 first pseudonoise (PN) function to provide a first PN spread signal, and said  
8 second transmission subsystem further comprises a second PN spreader for  
receiving said second Walsh coded signal and spreading said second Walsh  
coded signal in accordance with a second pseudonoise (PN) function to provide  
a second PN spread signal.

24. The apparatus of claim 23 wherein said first PN spreader and  
2 said second PN spreader utilize quadrature PN spreading.

25. The apparatus of claim 23 wherein said first PN spreader and  
2 said second PN spreader utilize complex PN spreading.

26. The apparatus of claim 23 wherein said second transmission  
2 subsystem further comprises a delay element for receiving said second PN  
spread signal and producing a delayed PN spread signal.

27. The apparatus of claim 26 wherein said first transmission  
2 subsystem further comprises a first transmitter for upconverting to a first  
4 frequency and amplifying said first PN spread signal and producing a first  
transmission signal, and said wherein second transmission subsystem further  
6 comprises a second transmitter for upconverting to a second frequency and  
amplifying said delayed PN spread signal and producing a second transmission  
signal.

28. The apparatus of claim 27 wherein said first transmitter transmits  
2 said first transmission signal through an antenna and said second transmitter  
said second transmission signal through said antenna.

29. The apparatus of claim 27 wherein said first transmitter transmits  
2 said first transmission signal through a first antenna and said second  
transmitter said second transmission signal through a second antenna.

30. The apparatus of claim 27 wherein said first frequency is equal to  
2 said second frequency.

31. The apparatus of claim 27 wherein said first frequency is greater  
2 than said second frequency.

32. The apparatus of claim 19 wherein said first transmission  
2 subsystem further comprises a first transmitter for upconverting to a first  
frequency and amplifying said first PN spread signal and producing a first  
4 transmission signal; and

wherein said second transmission subsystem further comprises a  
6 second transmitter for upconverting to a second frequency and amplifying said  
second PN spread signal and producing a second transmission signal.

33. The apparatus of claim 32 wherein said first transmitter transmits  
2 said first transmission signal through a first antenna and said second  
transmitter said second transmission signal through a second antenna.

34. The apparatus of claim 32 wherein said first frequency is equal to  
2 said second frequency.

35. The apparatus of claim 32 wherein said first frequency is greater  
2 than said second frequency.

36. The apparatus of claim 32 wherein said first transmitter transmits  
2 said first transmission signal through said antenna and said second transmitter  
transmits said second transmission signal through said antenna

37. A method for receiving an information signal, comprising:  
2 demodulating said first portion of a received signal to create a first  
demodulated signal;  
4 deinterleaving said first demodulated signal according to a first  
deinterleaving format to produce a first deinterleaved signal;  
6 demodulating said second portion of the received signal to create a  
second demodulated signal;

8 unshuffling said second demodulated signal to produce an unshuffled  
signal; and

10 deinterleaving said unshuffled signal according to a second  
deinterleaving format to produce a second deinterleaved signal.

38. The method of claim 37 further comprising multiplexing said first  
2 deinterleaved signal and said second deinterleaved signal to create a  
multiplexed signal.

39. The method of claim 38 wherein said multiplexing further  
2 comprises alternating symbols received in said first deinterleaved signal and  
said second deinterleaved signal, wherein all odd symbols of said  
4 demultiplexed signal are extracted from said first deinterleaved signal, and all  
even symbols are extracted from said second deinterleaved signal.

40. The method of claim 38 wherein said multiplexing further  
2 comprises alternating symbols received in said first deinterleaved signal and  
said second deinterleaved signal, wherein all even symbols of said  
4 demultiplexed signal are extracted from said first deinterleaved signal, and all  
odd symbols are extracted from said second deinterleaved signal.

41. The method of claim 38 further comprising receiving said  
2 demultiplexed signal and decoding said demultiplexed signal in accordance  
with a predetermined forward error correction format to extract an information  
4 signal from said demultiplexed signal.

42. The method of claim 37 wherein said first deinterleaving format is  
2 the different from said second deinterleaving format.

43. The method of claim 42 wherein said first deinterleaving format is  
2 block deinterleaving and said second deinterleaving format is bit reversal  
deinterleaving.

44. The method of claim 37 wherein said first deinterleaving format is  
2 the same as said second deinterleaving format.

45. The method of claim 37 wherein said unshuffling comprises  
2 cyclically rotating sets of a predetermined number of symbols.

46. The method of claim 45 wherein said predetermined number is  
2 four.

47. The method of claim 46 wherein said unshuffling comprises  
2 rotating said sets of four symbols by two symbols.

48. The method of claim 37 wherein said unshuffling comprises  
2 flipping sets of a predetermined number of symbols.

49. The method of claim 48 wherein said predetermined number is  
2 four.

50. The method of claim 37 wherein said first demodulation  
2 subsystem further comprises a first receiver subsystem for amplifying and  
downconverting from a first frequency a received signal to produce said first  
4 portion of a received signal, and

wherein said second demodulation subsystem further comprises a  
6 second receiver subsystem for amplifying and downconverting from a second  
frequency said received signal to produce said second portion of a received  
8 signal.

51. The method of claim 50 wherein said first frequency is greater  
2 than said second frequency.

52. A method for transmitting an information signal, comprising:  
2 interleaving a first portion of said information signal in accordance with a  
first interleaving format to provide a first interleaved signal;  
4 shuffling and interleaving a second portion of said information signal in  
accordance with a second interleaving format to provide a shuffled and  
6 interleaved signal;

transmitting said first interleaved signal on a first transmission channel;  
8 and  
transmitting said shuffled and interleaved signal on a second  
10 transmission channel.

53. The method of claim 52 further comprising demultiplexing said  
2 information signal into said first portion and said second portion.

54. The method of claim 53 wherein said demultiplexing comprises  
2 placing each odd symbol into said first portion and placing each even symbol  
into said second portion.

55. The method of claim 53 wherein said demultiplexing comprises  
2 placing each even symbol into said first portion and placing each odd symbol  
into said second portion.

56. The method of claim 52 further comprising encoding a set of bits  
2 in accordance with a predetermined forward error correction format to provide  
said information signal.

57. The method of claim 56 wherein said forward error correction  
2 format is a convolutional encoding format.

58. The method of claim 56 wherein said forward error correction  
2 format is a turbo coding format.

59. The method of claim 52 wherein said first interleaving format and  
2 said second interleaving format are block interleaving formats.

60. The method of claim 52 wherein said first interleaving format and  
2 said second interleaving format are bit reversal interleaving.

61. The method of claim 52 wherein said first interleaving format is  
2 different from the said second interleaving format .



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